expressed themselves in no uncertain terms to the effect that, for general meteorological purposes, the reduction to standard gravity is imperative, and that it should be uniformly adopted by all national services and not later than January 1, 1901. In fact, the Polar Conference had already urged this step in 1884 as imperative even at that time, and the Chief Signal Officer, General Hazen, acting promptly upon this request, introduced this correction with the monthly constants for January, 1885, and continued it, in connection with Ferrel's reduction to sea level, on August 1, 1886; but, on January 1, 1888, this improvement was abandoned in order to await the general action of all national services. The recent extension of the service of the Weather Bureau so that our daily weather maps now comprehend the region from latitude 10° to 55° north, brings the importance of the gravity question into great prominence, and by recent instructions, No. 92, dated October 19, the correction will be applied to all mercurial barometers of the Weather Bureau on and after January 1, 1899. The correction will be applied at the same time with those for temperature and other instrumental errors, thus giving first the correct pressure in standard inches of mercury for the locality of the barometer. This local pressure is then reduced to sea level or to any other desired altitude, and the new pressures thus obtained will also be expressed in terms of the recognized international standards.

INSTRUCTIONS No. 92, 1898.

Owing to the recent extensions of the Weather Bureau in the West Indies and along the South American coast, the whole territory now reporting barometric pressures embraces a wide range of latitude, and the barometric readings corrected for temperature and instrumental error only, at the extremes, are widely discordant, owing to variations in the force of gravity with latitude. Therefore, on and after January 1, 1899, the appropriate correction for gravity will be applied to all barometric readings. This correction is nearly constant at any one station, and is given in Table II, page 66 of Circular F, Instrument Room. The gravity correction to be used at a station will be incorporated with the correction for instrumental error and capillarity, and a correction card giving the appropriate correction for each instrument will be furnished by the Instrument Division.

The following example will elucidate the complete correction of the barometric reading:

Attached thermometer 76.5°; observed barometer reading		30.287
Correction for temperature	—0.131	
Correction for gravity, instrumental error, and capillarity	—0.066	
Total correction		—0.197
Corrected reading		30.090

The total correction, ascertained as shown above, will be entered on Form No. 1001–Met'l in the column in which the correction for temperature has been recorded heretofore. Observers may find it convenient to compute a small station table, by combining once for all the gravity and instrumental error corrections with those for temperature, thus giving the total correction for the ordinary temperatures and pressure that prevail at their stations. A new table must be prepared, however, whenever a new correction for instrumental error is employed.

The corrected reading, derived as above, is a standard measure of atmospheric pressure, and is perfectly comparable with similarly corrected readings made at any place the world over.

It takes a long time to overcome the conservatism of the practical world. Men are so accustomed to think in the terms taught them in childhood that even after they have long since perceived that those terms have acquired a new significance and ought to be expressed by new words, or new standards, they still hold on to the old ones.

They may know that the barometer is affected by the temperature of its scale and its mercury, and that both the atmospheric pressure and the weight of the column of mercury depend upon the downward pull of the force of gravity, but they may be slow to take the trouble to make the necessary corrections and allowances. Exact meteorology is now engaged in studying the atmosphere as a whole and demands that atmospheric pressure should be everywhere measured by the same standard and not by one that varies with the temperature or the latitude. There was a time when every city and country could have its own standard foot, pound, and bushel, but this confusion is now largely abolished in commercial matters and must, also, be abolished in science. We must measure pressure in some uniform standard unit, such as the weight of a pound of mercury, or the height of a column of mercury, under standard gravity. The pressure, per square inch, that will hold up fifteen pounds of mercury under the standard gravity that prevails under 45° of latitude and sea level, will not hold up so much mercury when the attraction of gravitation upon the mercury increases, as it does do as we go northward toward the pole. The reduction to standard gravity is simply an effort to convert our measurements of atmospheric pressure into one common unit so that they will be strictly comparable among themselves all over the world.

THE PRACTICAL SIDE OF WEATHER BUREAU WORK.

The observers in charge of Weather Bureau stations are expected to be, not merely faithful observers and studious meteorologists, but also eminently practical men. That is to say, they must know when, where, and how to apply their knowledge to the best interests of the community around them, and that community consists not merely of the citizens of the city or town in which the station is located, but also includes all the country tributary thereto. We have not yet learned that any other government weather bureau has called upon the merchants or citizens to form local meteorological committees to advise with the local observers as to their mutual interests; but this is always done by the United States Weather Bureau, and has been one of the most important means of securing the appreciative support of the people. We are led to these remarks by a paragraph in the recent annual report of the Chamber of Commerce of Chattanooga, commenting upon the work of our observer in charge, Mr. Lewis M. Pindell. Of course, this report is but one of hundreds that are made from time to time by every local committee on meteorology. If similar committees were established in other countries, their respective weather services would, perhaps, profit thereby as the United States Weather Bureau has done.

THE WEATHER BUREAU AND THE LIBRARIES.

Although the publications of the Climate and Crop sections are widely distributed in their respective States, yet it has always been difficult to secure sets of them for preservation in libraries outside of the States. In order to remedy this difficulty, the Chief of the Weather Bureau has directed that complete sets of all the monthly reports of sections be deposited with the larger libraries of the United States, and the special meteorological libraries of foreign countries. The list thus far agreed upon is as follows:

The Library of Congress, Washington, D. C.
The Free Public Library, San Francisco, Cal.
The Public Library, Chicago, Ill.
The Public Library, Boston, Mass.
The Public Library, St. Louis, Mo.
The Astor Branch of the Public Library, New York, N. Y.
The Meteorological Office, Toronto, Canada.
The K. P. Met. Institut, 6 Schinkelplatz, Berlin, W.
The Deutsche Seewarte, Hamburg, Germany.
The Centralanstalt f. Met., Vienna, Austria.
The Central Physical Observatory, St. Petersburg, Russia.

The Bureau Central de Météorologie, Rue de l'Université, Paris.

The Meteorological Office, 63 Victoria street, London, S. W.

The Indian Meteorological Office, Calcutta, India.

THE CHEMICAL THERMOSCOPE.

We copy the following from the Scientific American for November 26; it describes the method of making a little instrument that is found in many houses and is frequently called a barometer, or sometimes a "weather indicator" or a chemical hygrometer. Probably all these names are quite inappropriate and misleading. The liquid within the glass is so sealed up that neither the pressure nor the moisture of the external air can have any influence upon it. It is really a form of thermoscope; the changes in the appearance of the liquid within the glass depend upon the temperature only and can have no more connection with future weather than the changes in a thermometer. A great many other combinations of chemicals dissolved in water, alcohol, coal oil, or other liquids can be constructed to show the rise and fall of the temperature, but an ordinary thermometer is, of course, much better. The Editor does not believe that the instrument described below can have any value, either as a thermometer or barometer, hygrometer or weather indicator. In one location or at one season of the year, it will predict clear weather, but a few hours later, when the temperature of the room changes, its own indications will change correspondingly, and it will predict rain or snow. Nevertheless, as many inquiries have been received, asking for the method of construction, we submit the accompanying with the special request that if any of our observers constructs one of these thermoscopes, he will kindly keep a record of its appearance at every daily maximum and minimum temperature for a month or more and study out its value as a weather prophet.

Dissolve 10 grammes of camphor, 5 grammes of saltpeter, 5 grammes of sal ammoniac, in 105 grammes of alcohol (90 per cent) and 45 grammes of distilled water. After filtering, fill glass tubes 2 centimeters wide and 50 centimeters long with this solution, cork up well below and above, seal and fix on boards by means of wire, similar to barometers. The changes of the solution signify the following: Clear liquid, bright weather; crystals at bottom, thick air, frost in winter; dim liquid, rain; dim liquid with small stars, thunderstorms; large flakes, heavy air; overcast sky, snow in winter; threads in upper portion of liquid, windy weather; small dots, damp weather, fog; rising flakes which remain high, wind in the upper air regions; small stars in winter on bright sunny day, snow in one or two days. The higher the crystals rise in the glass tube in winter, the colder it will be.

KITE WORK IN MADEIRA.

According to Nature, 1879, Vol. XX, p. 444, in the Report of the British Association for 1879, p. 63, will be found the Report of the committee on atmospheric electricity in Madeira, by Dr. M. Grabham, who gave himself to the observation of the regular winds and breezes and their connection with electrical phenomena. Of course, the kite was used for this purpose, and Dr. Grabham notes that—

The thinness of the currents of air constituting sea breezes was demonstrated in the bay of Funchal by flying a kite vertically beyond into the true wind blowing in a contrary direction. Abortive attempts were made to bring down the upper electricity through the lower currents. The electricity of the general northeast wind, which is identical with the trade wind, was found on the heights at the east end to be uniformly moderate and positive.

At the approach of the rain clouds at the termination of a period of fine weather, the atmosphere invariably gives increased readings, and no negative observations were recorded.

The kite is specially adapted to the study of the sea breeze, which usually constitutes but a thin layer of air, and should be applied by those who resort to the shores of our oceans and Great Lakes.

PROGRESS IN KITE WORK.

The October number of the Quarterly Journal of the Royal Meteorological Society contains an historical article by Mr. A Lawrence Rotch on the work done at the Blue Hill observatory in the development and use of the kite. In the discussions following this excellent article, Mr. R. C. Mossman gives an account of the work done by Mr. John Anderson, late of Owensboro, Ky., but now residing in Edinburgh, in flying kites at the latter city for meteorological purposes.

Capt. Baden Powell explained the construction and management of his form of kite. Mr. Rotch stated that the Baden Powell kites had been tried at Blue Hill, and that, although they started in a lighter wind than the Hargrave kites, yet they were not sufficiently stable in winds of varying velocity without using side lines, which precluded the attainment of great height.

Mr. R. C. Mossman stated that from work done by Prof. Michie Smith on the summit of Dodabetta, India, it was found that the electric potential on the edge of a dissolving mist is lower than the normal, while in a condensing mist it is higher than the normal. It is proposed to make observations on this point by the use of kites near Edinburgh, in order to ascertain whether the same phenomenon occurs in the free air as on the mountain tops.

ORIGIN OF TORNADOES.

Dr. B. F. Duke, of Pascagoula, Miss., sends an account of a tornado observed by him in April, 1894, possibly at or near that place.

I was located on the edge of a track about a mile and a half wide, within which nearly everything was swept before the wind. It was a cloudy day, and thunder and rain had been observed all the afternoon in the west under very dark clouds. About 6 p. m. these clouds suddenly became very black in one place while everything around the observer was very calm and still. Soon a terrific roaring could be heard in the distance. As it approached, a low stratum of muddy cloud could be seen in the west, flying from northwest to southeast, while another stratum was coming up equally fast from the south, and puffs of wind from these two directions were alternately felt by the observer. All this occurred a little in advance of the dense black cloud, which was streaked with lightning, though not funnel-shaped so far as we could discern. When it (the tornado?) had passed by us, it was seen that the timber on the north side of the track was blown to the southeast while that on the south side fell toward the north, but in the center, or nearly so, it was piled in every direction and in the greatest possible confusion. In some places the wind seemed to have made all sorts of breaks and deflections, blowing in strips of a quarter of a mile or more, directly opposite to the general course which was nearly northeast. In some of these dashes, if we may so speak of them, it (the wind?) would appear to have been heavier than in the main body of the storm.

What conditions of the earth and air give rise to the south and the northwest winds and the clouds that preceded the hurricane?

Is there not a strong attraction between them? When they meet, is not this affinity neutralized? Had these winds been coming from exactly opposite directions, would not the cyclone (tornado) have occurred throughout the whole length at the same moment? Does a tornado actually travel, or is its velocity to be reckoned by the acuteness, or obtuseness of the angle of these two approaching currents, which might be illustrated by two lines of battle advancing toward each other at the angle indicated, namely, one moving from south to north, the other from northwest to southeast; the time required for the two entire lines to meet depending upon the speed maintained?

In the United States when the weather map shows a center of low pressure, there is generally an extensive area of cold northerly winds and high pressure west of the center; but a region of warm southerly winds south and east of it. What conditions of the earth and air give rise to these winds? The only answer must be that the differences in density of different portions of the atmosphere cause these portions to be acted upon differently by the attraction of gravity and by the centrifugal force of the revolving atmosphere. Gravity pulls the denser air down, so that the cold northwest wind